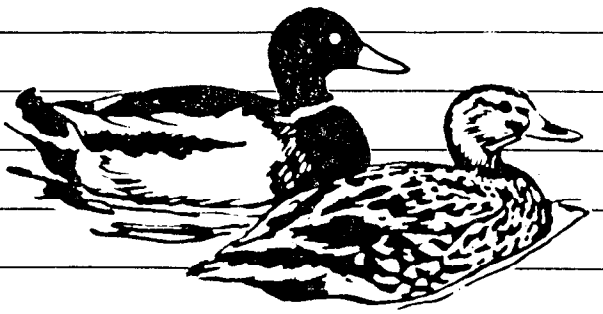
Research



Information bulletin

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

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Understory Tree Planting may Enhance Bottomland Hardwood Reforestation Sites

The U.S. Fish and Wildlife Service is reestablishing bottomland hardwood forests on old agricultural fields and other disturbed sites in the lower Mississippi Valley. To date, efforts have concentrated on reestablishing key hardwood mast-producing tree species, especially oaks. Although this approach has proven effective for establishing adequate overstory tree cover (e.g., USFWS Research Information Bulletins 89–115 and 90–48), the natural establishment of understory species does not seem to be completely satisfactory on many reforested sites.

The value of reforested sites to wildlife probably could be increased by planting understory species because they provide an additional source of food and cover. Here, we report on the first-year results of a pilot study to test the feasibility of planting an understory tree species.

Mayhaws Were Planted on Three Sites

We planted 25 mayhaw (*Crataegus aestivalis*) seedlings in mid-March 1990 on each of three sites in the Yazoo National Wildlife Refuge in western-central Mississippi. Mayhaws were chosen as a trial species because 1-year-old bare-root seedlings were available commercially, which is not yet true for most other understory tree species, and mayhaws produce a fruit that is eaten by a wide variety of birds and mammals.

The three sites chosen represent different stages in the development of reforested fields. The first site was an open field and represented conditions that might occur if the mayhaws were planted at the same time as the overstory tree species (i.e., with full overhead light). The second site was a stand of water and willow oaks (*Quercus nigra* and *Q.* phellos) planted in March 1982. The oaks were about 5 m tall and therefore the mayhaws were subject to a moderate amount of shade. The third site was a mature, natural stand of bottomland forest, with a heavily shaded understory. All three sites were on Dundee silty clay loam soils, although the open field site was slightly lower in elevation and probably had a higher clay content and more frequent flooding.

First-Year Survival and Growth Evaluated

The mayhaw seedlings were remeasured in mid-February 1991. Initial heights, heights after one growing season, and first-year survival are summarized in Table 1. First-year survival was quite good at all three sites, with an overall survival of 91%.

Fifty-three percent of the surviving seedlings showed evidence of browsing damage, apparently by rabbits. Browsing occurred at all sites, but was most severe in the mature forest site, where it resulted in a negative average growth rate for the surviving seedlings. Reduction in height of some seedlings

from browsing accounted for the low overall growth and greater variability in heights of all surviving seedlings (Table 1).

When seedlings with browsing damage were excluded, analysis of covariance (with initial height as the covariate) showed significant difference between sites in height growth (d.f. = 2; F = 7.40; P > F = 0.0026). As indicated in Table 1, the site with the intermediate light level exhibited the best growth (when browsed seedlings were excluded).

Implications for Reforestation Projects

These preliminary results suggest that it is feasible to return to older reforestation sites and carry out enhancement plantings of understory species. Indeed, it may be preferable to wait several years after the initial planting (i.e., until the overstory trees have grown large enough to provide partial shading) because in this study the site with partial shading had the best first-year survival and growth. We plan to continue monitoring this trial for several more years, by which time we will know if the intermediate site continues to have the best survival and growth.

Protecting individual seedlings from browsing may prove to be cost effective, especially for small-scale enhancement plantings. One possible means of protecting seedlings that should be investigated is plastic tree shelters. They protect tree seedlings from a variety of herbivores and, by increasing temperature and CO_2 levels and decreasing transpiration, have the additional advantage of enhancing growth.

We hope that our pilot study will inspire others to attempt enhancement plantings with understory species. Improved habitat quality for a wide variety of game and nongame wildlife should result from such plantings.

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Table 1. Survival, initial heights, and heights after one growing season of mayhaws during three stages of reforestation.

Site No.[1]	Relative light level	Mean initial height (cm)	Std. dev.	Mean height after one growing season, browsed and unbrowsed trees (cm)	Std. dev.	Mean height after one growing season, unbrowsed trees only (cm)	Std. dev.	First-year survival
1	High	27.4	4.9	28.9	13.5	33.6	12.6	80
2	Medium	27.8	9.1	29.2	18.2	42.3	6.6	100
3	Low	24.2	5.7	22.7	11.1	32.8	7.8	92

[1] Site 1 is the open field; Site 2 is the reforested site planted in 1982; and Site 3 is the mature natural forest.